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Silent walkie-talkie: A Toy for deaf children

Roberto P. Acosta

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ROCHESTER INSTITUTE OF TECHNOLOGY

A Thesis Submitted to the
Faculty of the College of
Imaging Arts and Sciences
in Candidacy for the Degree of

MASTER OF FINE ARTS

SILENT WALKIE-TALKIE A TOY FOR DEAF CHILDREN

By

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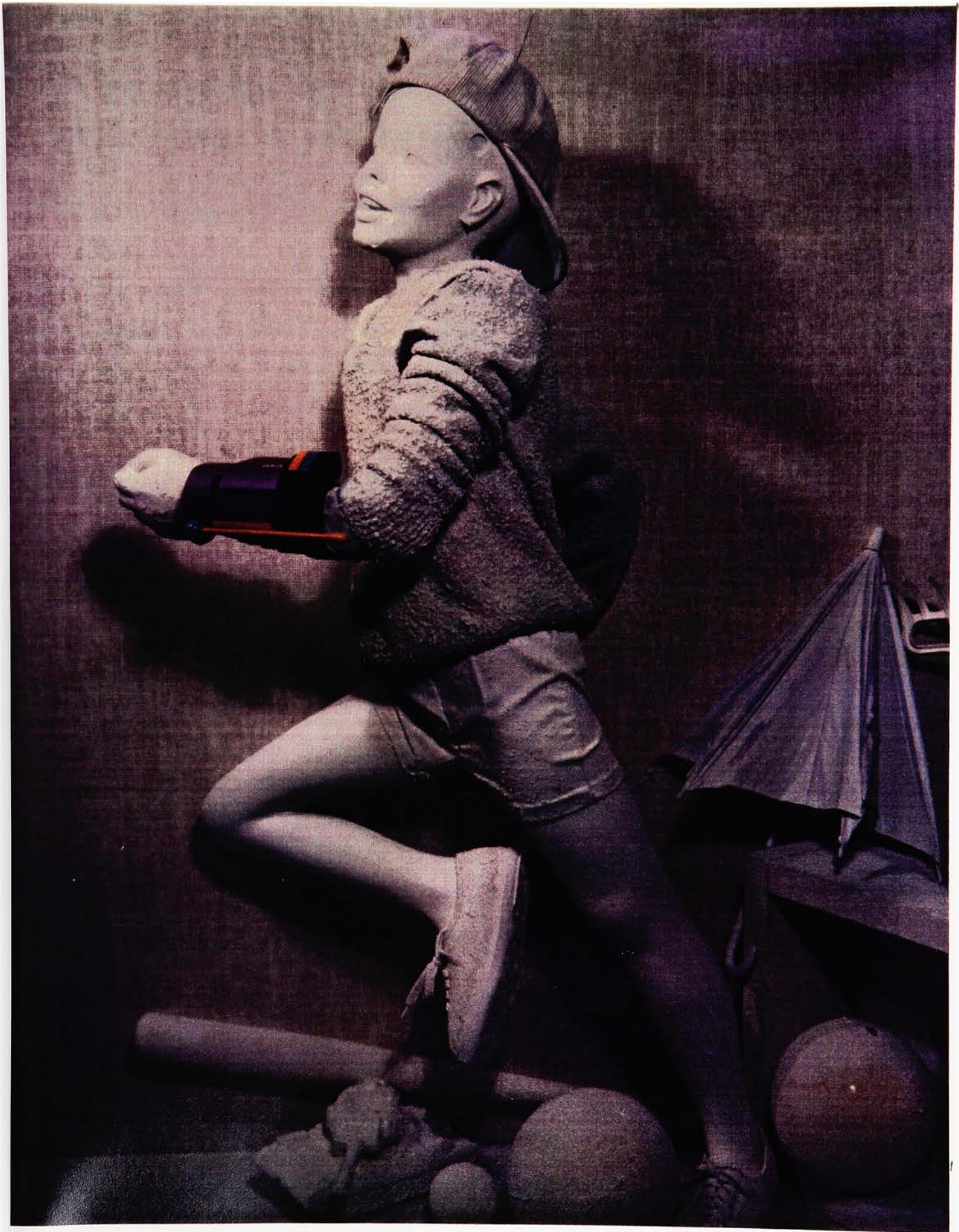
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Introduction.

Why a toy for deaf children?

The recreational needs of differently-abled children is an area that industry has not covered properly up to the present. The toy manufacturers do not seem to consider this particular segment of the market big or attractive enough. For that reason, I decided to take advantage of the academic environment provided by graduate school to develop an approach that in some way might satisfy some of the requirements of those special children.

Given the availability of institutions such as the National Technical Institute for the Deaf and Rochester School for the Deaf, as well as daily contact with deaf students at Rochester Institute of Technology, I decided to narrow down the scope of this project to deaf children.

The very first question that arose when I began to work on this project was "Why should a toy for deaf children be different from other toys?" In order to find an answer to that question this project was based on an initial research phase which included bibliographical consultation and interviews with different specialists on matters related to the deaf. That investigation was completed before the beginning of the sketching stage and it determined the conceptual orientation for the design process.

As a result of the analysis of the available information, I realized that even though deaf children are not different from hearing children in terms of recreation, there are some particular skills and values important for their futures as adult members of

the deaf community that can be introduced and exercised during childhood through games and toys. Therefore, the purpose of this thesis is to design a product that provides recreation at the same time that it helps to develop some of the abilities needed by deaf children in order to function effectively later on in life.

There have been many projects dealing with aspects related to the deaf. All had good intentions, but, some were more successful than others. Each of these projects, consciously or unconsciously, represents a different way to approach deafness. The intention of this project, instead of trying to make deaf people similar to hearing people, is to create a product which responds to the natural abilities and values of the deaf.

Research

Approaching Deafness.

When I first considered the possibility of working on a project which involved the recreational needs of deaf children, I decided to begin by surveying people related to the Deaf community regarding their general feelings about this idea.

With this purpose in mind I prepared an initial proposal that summarized the original objectives and the intended scope of the project, as well as a simple questionnaire designed to obtain suggestions, evaluate feasibility and determine the actual need of designing a toy specifically created for deaf children. Then, using this material, I had several interviews with people in both the National Technical Institute for the Deaf and the Rochester School for the Deaf.

From those interviews I received, on the one hand, many ideas and a very positive response about the potential interest of the topic as a subject of research and as a design problem; on the other hand, I was faced with my own ignorance and lack of sensitivity that, in spite of the good intentions, showed through my initial set of assumptions. What I originally interpreted as hypersensitivity toward the use of terms such as "handicapped" or "disabled" proved to be only the tip of the iceberg. By sharing points of view of the persons I interviewed and through the readings and references that they recommended, I was exposed to a different perspective of the situation that affected my perception of the design problem which I was about to face. In my opinion, that was the most important outcome of the first segment of the research process.

Terminology

As I mentioned before, one of the problems that became evident during the interviews and in my initial proposal was the use of terminology.

First of all, I made the mistake of using the word "handicapped." This term, besides being offensive to people related to the deaf community, carries implications of deficiency or pathology that I want to avoid, by any means. Instead, I am going to use "differently-abled," as a general term, when referring to persons who do not have the same abilities as most people in some specific aspects. The first time I heard this term was from the psychologist Joe Yanda during an interview at the Rochester School for the Deaf. I consider this term more accurate and appropriate to the spirit of this thesis.

There is also another aspect regarding vocabulary that needs clarification. I found through my literature search that some authors, especially in the United States, use a particular convention for the term "deaf." I consider it convenient to apply the same differentiation throughout this report.

Following a convention . . . we use the lowercase *deaf* when referring to the audiological condition of not hearing, and the uppercase *Deaf* when referring to a particular group of deaf people who share a language and a culture (Padden and Humphries 1988, 2).

Finally, there is also a controversy involving the terms "hearing-impaired" and "deaf":

Although in recent years the term "hearing-impaired" has been proposed in an attempt to include both Deaf people and other people who do not hear, Deaf people still refer to themselves as "Deaf" (Padden and Humphries 1988, 43).

As we can see, the term "hearing-impaired" does not seem to be totally accepted yet. However, we have not found a better term to include all the people who do not hear.

Pathological vs. the sociological view

At the very beginning of the investigation, after the initial contacts with the specialists, it became evident that it was necessary to define a theoretical frame of reference to be adopted as a guide during the decision making process for this project.

Basically, there are two ways to approach and understand deafness: the pathological view and the sociological view. The first one, widely spread and historically dominant, assumes that deaf people have a deficiency (pathology) which must be treated or somehow overcome in order to bring the person with a hearing impairment as close as possible to the range of "normality" in terms of hearing parameters. The second, relatively new, considers deaf people as a segment of the global population that constitutes a subculture by itself with its own values, history and language. Evidently, the results of any attempt to deal with

aspects of the life of deaf people are going to be significantly different depending of which of these orientations is adopted.

There are many existing misconceptions regarding deafness. These misconceptions are not just isolated abstract ideas. On the contrary, they represent a philosophy which has had a deep impact in very concrete aspects of the lives of deaf people.

Traditionally, most medical, educational and social policies that affect deaf people nowadays have been influenced toward the pathological view since their origins. However, during the last decades some sociologists, psychologists, and especially people from the Deaf community began to react against that trend:

Perhaps the most important, certainly the most troubling, assumption made by citizens and by concerning practitioners is that deafness is a deficit (Padden 1980,89).

Dr. Paul Higgins from the Department of Sociology of the University of South Carolina put this issue in an interesting perspective. In the introduction to the book Understanding Deafness Socially, he quotes the concept "handicapism":

. . . a set of assumptions and practices that promote the differential and unequal treatment of people because of apparent or assumed physical, mental, or behavioral differences (Bogdan and Bliken 1974, 19).

Extending that concept to "deafism," Higgins established similitudes between this phenomenon and racism. Given these

considerations it is not surprising that many authors attribute the failure of many plans and policies concerning deaf people to their "pathological roots."

But, how is this situation reflected in the apparently simple action of designing a toy? Obviously, a toy is a product whose users are children. Games and toys constitute important means by which children create a perception of themselves in relation to the world. The intention of this project is to assume the responsibility of creating a product that provides deaf children with elements that enable them to increase the chances of fully developing their potentials. One important factor in reaching that goal is to communicate to those children the message that with their natural capabilities and values, they are able to achieve their optimal development as human beings. Therefore, I decided that the results of this work would significantly benefit from considering deafness as a social feature instead of as a deficit.

Sound and meaning

The perception of sound is what makes deaf people different from other people. In order to design for the deaf, I consider it important to start by understanding how both, hearing and non-hearing people, relate to sound and what the implications of those relationships are.

Sound, by itself, is only one among many performing elements that provide information about the world around us.

However, the perception of sound involves a lot more than awareness of a simple physical event:

There are two ways to think about sound. The most familiar is that sound is a change in the physical world that can be detected by the auditory system. This is the supposedly bare "acoustic" definition. But what is often overlooked is that sound is also an organization of meaning around a variation in the physical world (Padden and Humphries 1988, 92).

One of the examples used by the authors to illustrate that concept in the book Deaf in America is very fitting for this report because it involves a child. This is the case of a deaf child born to a hearing family:

. . . We can imagine that Jim, whose hearing family did not even realize he was deaf, must have noticed "strange" dependencies between events and behaviors. One behavior would suddenly be provoked, and it would not be clear to the young boy what the stimulus was. Imagine Jim sitting in a room near a door. Suddenly his mother appears walking purposefully to the door. She opens the door, and there is a visitor waiting on the door step. But if the child opens the door at another time, odds are that no visitors will be there. How does the child, who does not hear the doorbell, understand what the stimulus is for the odd behavior of opening a door and finding someone standing there? (Padden and Humphries 1988, 21).

That example made me realize that a way to facilitate the approach of deaf children to a productive and happy life could be to create mechanisms that help them to establish the missing connection between many apparently independent fragments of information. That idea could be incorporated in some way to the concept of a toy.

Most likely, many misunderstandings between hearing and deaf people have their origins in misconceptions about how each perceives his or her surrounding environment. All the human senses play an important role in that perception. For hearing people, sound is a natural and continuous source of reference to the world. Deaf people do not perceive the stimulus of sound in the same way that hearing people do; however, it doesn't mean that deaf people do not have any concept of sound.

Hearing people mistakenly assume that Deaf people have no concept of sound. The truth is that many Deaf people know a great deal about sound and that sound itself - not just its absence - plays a central role in their lives . . . Very little is not filtered through the larger pattern of every day life. Sound is not an entity free of interpretation, but something that emerges within a system of knowledge. One does not merely "hear" thunder, but also assimilates its place in relation to all activity around the world, how to react to it, how to talk about it, how to know its relationship to other sounds. for both Deaf and hearing people, sound finds

its place against the pattern of every day life (Padden and Humphries 1988, 23).

Perhaps good evidence of how deeply some concepts normally associated to sound are familiar to deaf people can be found in the notions of harmony, dissonance and resonance present in poetry created in sign language.

For instance, all the information about sound, meaning and deafness that was reviewed in this chapter opened some possibilities in relation to the design problem of this thesis. One of these possibilities was to try to design a toy that, by explaining relationships between stimulus and events in real life, could help deaf children to improve their perception of the world. On the other hand, there is also the possibility of taking advantage of the natural knowledge that deaf people have about sound and to include in the toy some features that help to exercise and expand their concepts.

The deaf as a social segment

I intended to design a product that could be used for any children with a hearing impairment. As a next step, it was necessary to study the segment of the population that was going to be the target of this project.

According to the sociological point of view chosen to approach the design problem, being a part of the Deaf community

provides deaf children with a better chance to positively adapt to life. It is important to remember that not all individuals with a hearing loss belong to what is defined as the Deaf community. Considering this, I thought that an interesting challenge would be to explore ways to expose hearing-impaired children to the values of the Deaf culture through games or toys.

As stated before, a Deaf community is understood as a particular group of deaf people who share a language and a culture. For example, in the case of the United States, American Sign Language is one of the parameters to consider:

Self identification with the group and skills in ASL should be important diagnostic factors in deciding who is Deaf (Markowitz and Woodward 1978, 29).

Although the reviewed literature contained data almost exclusive from the United States, I do not think it is wrong to assume the existence in other countries of groups of deaf people with a sense of community and sharing of a language. This assumption is relevant to this thesis, because as an exchange student, I cannot limit the scope of my work to the actual conditions of the United States; I also have to have in mind the situation of countries like mine (Venezuela), if I want to make this thesis experience valuable for my future as a designer.

Probably one of the most characteristic features in the configuration of any Deaf community is the fact that a high percentage of the deaf population comes from hearing families. Therefore, the contact of these children with the Deaf culture

happens very often outside the family and in different periods of time during their lives. In most cases, that interface occurs when the child starts attending school. Many authors agree that the sooner this transition takes place the bigger the probability of the individual to successfully adapt to his or her future life. At this point, I realized that to provide deaf children, especially those who come from hearing families, as early as possible with elements for daily use which enhance values of the Deaf culture would potentially be very beneficial.

The Deaf community, as any other subculture, needs to establish connections with the rest of society without losing its own identity. To expect that a deaf individual will spend his or her life within the limits of the Deaf community would be not only unrealistic but also unhealthy. Further, it is well known that a toy can be a very effective socializing tool during childhood. Consequently, I considered that it would be an asset to design the toy in a way that could be shared by deaf and hearing children equally; or even better to design a toy whereby being deaf was an advantage.

In summary, regarding the social variables of the problem, some ideas that could be used as a reference during the design process have been discussed. First, the benefit of having a toy that expresses the values of the Deaf community was confirmed. Second, the intention to produce a design targeted to hearing-impaired children whether or not they already belong to a particular Deaf community was expressed. Third, it was decided to make the product available and attractive to hearing children.

Finally, the idea of creating a design whose characteristics make the product flexible enough to be adapted to different social and ethnic environments was explained.

Deafness and communication

Communication is probably the most polemic aspect regarding deafness. Proof of that could be the fact that, recently, one of the most widely accepted definitions of deafness focuses on this area:

Deafness is the inability to hear and understand speech through the ear alone (Higgins and Nash 1987, 5).

Communication is the key to establishing bridges between the deaf and hearing. Any project related to the deaf has to deal with communication, sooner or later. This project is not an exception.

Certainly, through communication, we can make the process of adjustment and development for a child easier or more difficult. The product that is going to be designed could be considered somewhere in the range of educational toys. Communication is implicit in the concept of any educational toy. A product of this kind has to be able to transmit some information to the child who is playing with it. Obviously, we have to do that by using a

language. But the question is: what kind of language? The answer is not easy.

There has been a very long argument about what kind of communication should be encouraged in deaf people. Helmer Myklebust, in his book Psychology of Deafness stated a theory that influenced most of the official attitudes toward deafness, especially in the United States, during several decades:

The manual sign language used by the deaf is an Ideographic language . . . Ideographic language systems, in comparison with verbal symbol systems, lack precision, subtlety, and flexibility. It is likely that Man cannot achieve his ultimate potential through an Ideographic language . . . The manual language must be viewed as inferior to the verbal as a language (Myklebust 1957, 241).

This philosophy has had a deep impact on the life of deaf people, especially during childhood. According to some authors, when the deaf child starts to relate to a new environment, such as the school, he perceives the situation as a particularly perturbing factor:

Even his language has ceased to be just a mean of interacting with others and has become an object: people are either "against" or "for" signed language (Padden and Humphries 1988, 18).

As a consequence, many people from the Deaf community reacted and developed the feeling that they have been forced to use a language intended for people with different biological characteristics. Theories like Myklebust's have had very negative effects:

The mistaken belief that ASL is a set of simple gestures with no internal structure has led to the tragic misconception that the relationship of Deaf people to their sign language is a casual one that can be easily replaced (Padden and Humphries 1988, 9).

Padden and Humphries support another trend of thinking which, opposed to Myklebust's point of view, says :

. . . signed languages are far from the primitive gestural systems they have been assumed to be. Instead they are rich systems with complex structures that reflect their long histories (Padden and Humphries 1988, 58).

Now, how does one apply the implications of these issues to the design problem? Without being a specialist in communication it is hard to adopt a position. However, there are some levels on which some decisions can be made.

On one hand, in the case of a toy which involves active communication between itself and its user, I consider it appropriate to promote the use of sign language. The reason is because, this way, the product would be more adequate to the

requirements of a Deaf community increasingly aware of their culture and values and, at the same time, the toy would be more accessible to those children whose main means of communication is sign language.

On the other hand, to make a toy that allows Deaf children to interact with other hearing-impaired children and even with hearing children, it is necessary to find a common ground where all of them can communicate at the same level. In this case written language seems to be the optimum choice .

However, in the book The Language of Toys, Teaching Communication Skills to Special-Needs Children, I found a premise that reflects the position of this project concerning communication:

Language is a vital tool for our special-needs children to have, for it is through language - whether spoken, signed, pointed to or combinations of all three - that they will reach their fullest potential (Schwartz and Miller 1988, 15).

For this project, more important than the kind of language to be used, is the objective of contributing to a positive development of hearing-impaired children.

Deafness and education

There have been many studies which have evaluated the successes and failures in the education of deaf children. Even though toys cannot be a substitute for formal instruction, educational toys are, by definition, related to education. Therefore, the results of these studies provided some hints that helped the thinking process during this thesis research.

During the main part of this century theories supported by scientists such as Edward Sapir, Leonard Bloomfield and later Helmer Myklebust, who was mentioned earlier in this report, set the standard for how children, especially Americans, would be taught. More recent studies complain about the results of this trend:

This misconception more than any other has driven educational policy. Generations of school-children have been forbidden to use signs and compelled to speak. Other children have been urged to use artificially modified signs in place of vocabulary from their natural sign language (Padden and Humphries 1988, 59).

But the complaints have not only referred to the issues of language and communication. As Erting (1985) and others have pointed out, the focus in deaf education has traditionally been on the audiological aspect. According to them, for the persons in

charge of education for the deaf, the most compelling fact about deaf children is their inability to hear, which in turn requires that they receive special training in speaking and hearing. They also express concern for the fact that educators rarely have explored ways to introduce the resource of Deaf culture to young children who have not been exposed to it.

One aspect that was addressed during the process of interviews with teachers and psychologists at Rochester School for the Deaf was the fact that there is not only a lack of toys designed specifically for deaf children but, also, there are no books written specifically for them. A toy might be designed having these considerations in mind. In this regard it is possible to take advantage of the way the Deaf community has been preserving its history and values.

Apparently, a very popular character in almost every club, organization or party of the Deaf community is the "story-teller." This is a person who by using signed language, tells stories that have been passed from generation to generation. The stories usually contain essential elements of the tradition of Deaf culture. Perhaps a toy could introduce elements from this tradition in a fun way to hearing-impaired children.

An interesting suggestion made by Mr. Gary Mowl during an interview at the National Technical Institute for the Deaf was to consider the possibility of using holographic images to interact with deaf children. As it is possible to see in a speech given by George Veditz, a former president of the National Deaf Association as early as 1913, the concept of using some kind of

"advanced" technology for similar objectives is not strange to the Deaf community:

We want to preserve the signs that these men use to keep and pass on to future generations . . . There is but one known means of passing on the language: through the use of moving picture films (Padden and Humphries 1988, 57).

The deaf children

There are some specific characteristics of hearing-impaired children that are important to address in order to increase the probability of designing a successful product.

During an interview with psychologists and teachers, all of them members of the staff of the Rochester School for the Deaf, a number of those characteristics were mentioned. One of the things that they said was that deaf children, to some extent, do not have very sophisticated manipulating skills. Therefore, the level of precision required in the toy should be enough to encourage improvement of their dexterity but not be excessively high in order to avoid frustration in the children. Also, other comments were made concerning the fact that those children are very often behind hearing children in terms of social development. Consequently, to enhance the function of the toy a socializing agent should become a priority.

One point on which many specialists seem to agree is that age is not a reliable factor as a reference to make decisions about children:

Each child has his own profile for all developmental areas, including cognition, motor, social, self-help and language. A child may make progress in different areas at different rates. The result is a wide variation in the developmental picture for each child, regardless of his chronological age (Wolff and Wolff 1974, 115).

In the case of differently-abled children the range of this variation could be even bigger. Deaf children are not an exception.

According to the specialists, special-needs children should be evaluated on an individual basis and have learning goals set specifically for them. But that evaluation is not always easy for deaf people. For example, it is indicated that the person's age at the time communicative hearing is lost greatly influences the effects of deafness. Based on that factor, there are different categories of deaf people, such as: prelingual (before the age of three), prevocational (before 19), senescent (during advanced adulthood), etc.

To narrow down by age the audience for the product is not easy. However, I found an interesting reference that can be used as a guide for the purpose of this report.

The book Games Without Words, by Sidney and Caryl Wolff, contains a number of games created specifically for deaf children based on the developmental theories of Jean Piaget. The authors, in this case, define the type of child that can participate in the

proposed activities by using the stages of intellectual development of Piaget's theory as a reference. According to it, the authors suggest that the games in their book are appropriate for children in the "preoperational" and "concrete operational stages." In other words, instead of using age as a measuring factor they consider it more appropriate to address the capabilities of each child as an individual.

Another element that contributes to the diversity of developmental levels among deaf children is the kind of family they come from.

Nine out of ten deaf children come from nuclear families that have no deaf members. This fact means that the deaf child will be raised by parents who were unprepared for her or his deafness, who cannot depend upon their own experience for critical decisions about the child (Schein and Delk 1974, 37).

Several comparative studies have evaluated the differences between deaf children coming from deaf families and deaf children coming from hearing families. In each of these studies deaf children with deaf parents were found to perform at a higher level in matters such as academic achievement than did the deaf children with hearing parents. Also deaf children born from deaf parents tend to be better adjusted to school and to develop language more readily.

Another aspect is found in a study of family environment and achievement of deaf students made by Bodner-Johnson in 1986. In this study, based on interviews with 125 families with deaf children, and on school performance scores of the children, the authors conclude that children who were the most proficient readers had parents who were involved with their academic and recreational activities and had adapted to their children's deafness.

This last commentary reinforces the assumption that toys and recreation can contribute to better adjustment of the child in life, especially if the toy creates ways of communication with parents (hearing or not) and other people.

Toys and games

Throughout the investigation the market was checked to find which recreational products were available for deaf children. At least in the United States, not even one commercially available product could be found as a result of this search. Teachers, psychologists and parents of deaf children who were interviewed also said they were not aware so far of any toy specifically designed for hearing-impaired children. However, some interesting studies in this regard were found during the literature review.

Toys are how we teach our children about our world and how to live in it. With toys we can teach them how to interact with other people and their environment. And toys can substitute for the world while they are learning how to interact. Playing with toys is particularly important for children who have problems in adjusting to their world (Schwartz and Heller 1988, 25).

This statement contains some of the basis in which this project is founded. The authors also reminded us about two requirements that a toy must fulfill in order to accomplish its educational objective.

First, the toy must be interactive:

She or he learns that what she does can have an effect . . . It is through play that children learn about the world around them. While playing, children test ideas, ask questions and come up with answers . . . She learns cause and effect . . . when her blocks come tumbling down she can link that to the world of experiences and ideas (Schwartz and Heller 1988, 26).

Second, toys must be representational:

The most significant value of toys may be the way they represent a wider world for your children . . . you can use toys to prepare children for experiences that are about to happen and then use the toy again after the experience to reinforce what she saw (Schwartz and Heller 1988, 26).

But, we cannot forget the most important objective of a toy. The first goal of a toy must be to provide FUN. One way to look for information that could lead to discovering what "fun" means for a child is to observe the kinds of games that he or she creates for himself/herself. One of the teachers at the Rochester School for the Deaf, who was in charge of children between 7 to 9 years old, said that very often her students invent their own games, with their own rules. She also said that deaf children are very "visual." Therefore, color, shape, light or textures are excellent attention-catchers for them.

In the book *Deaf in America*, I found some documentation about usual games among deaf children. In the following paragraphs I will reproduce some of the stories found in that book:

One friend told us about the kind of activities he and his schoolmates engaged in during his early years at a school for the deaf. The boys' favorite after-school activity was watching a popular film serial of the time called *Blackhawk*, which came with a sound track conveniently concentrated in the bass range. (For many deaf people, the lower frequencies are the most easily detectable, creating not only loud sounds they can hear but vibrations on the floor and furniture). After each episode, the boys would gather in small groups with their favorite leaders, who would recreate each scene again in the finest detail. By reenacting the episode, the boys could remake the material into their own, taking ownership of what belonged to others (Padden and Humphries 1988, 94).

Other friends told about acting out airplane battles in the hallways, using their hands to represent the airplanes and the walls runways . . . Hallways were favorite places because the reverberation of the children's roars against the narrow halls make them sound even more like airplanes (Padden and Humphries 1988, 95).

. . . he and his young playmates, six to eight years of age at the time, would go into the playroom in the boys dormitory and invent games that used sound at as loud volume as they could manage. One game involved a contest to see who could make the loudest sound. "Loud", to them, meant sounds that favored the lower frequencies. The boys learned somewhere, our friend could not remember where or when, that they could make sound louder by projecting it into a corner rather than into the center of the room. They could use the walls as a resonating chamber. And to better direct the sound and increase its volume, they would cup their hands and direct the voice through the narrow channel of their hands into the corner . . . In the confines of their playroom and with their limitless imagination, the boys began to learn much about the properties of sound (Padden and Humphries 1988, 95).

Apparently these deaf children, as any other children, were fascinated by what to some extent could be considered "unknown" for them, in this case sound. Also, as the authors say, from the not very happy reaction of the teachers around

them, the children also received a "bonus" in very useful knowledge:

From the boys' many experiments, they acquired a great deal of common knowledge about how sound works, how volume and resonance interact in the carrying of sound waves across distance . . . Inevitably, at some point in the development of their knowledge about sound, Deaf children began to understand that one important thing to learn about sound is how hearing people think about it . . . Knowing about sound involves not only discovering its acoustic properties, but also, and more important learning the complicated conditions attached to it (Padden and Humphries 1988, 96).

This book also describes other common ways to play games among deaf children:

Sit on small chairs and in union sing-song a particular word - one was "to-mo-rrrow" - over and over again, learning the different ways to make spoken sounds. In another fortuitous discovery, they found that rapping on the window panes created deliciously loud noises . . . All this seemed to be part of the tradition passed down from one generation of school children to the next across schools many miles apart (Padden and Humphries 1988, 96).

Sue Schwartz and Joan E. Heller Miller, recommend in their book The Language of Toys the use of music as a source of entertainment and learning for deaf children:

Listening to and appreciating music is a marvelous activity to share with your child. If she has a hearing impairment, do not automatically deprive her of the fun of music. We are never quite sure exactly what sound is like for a hearing impaired child, so go ahead and expose her to the activity. Begin with music that has action to go along with it or finger plays and you may be pleasantly surprised to see how much enjoyment she gets from this activity (Schwartz and Heller 1988, 44).

To complete this review it would be useful to make reference again to the work done by Sidney and Caryl Wolff, recorded in their book Games Without Words. As explained before, this work is based on the developmental theories of Jean Piaget. These authors affirm that it is necessary to encourage throughout the games what Piaget calls "social transmission" - encounters with other people - in deaf children. That is because, according to them, "deafness promotes solitary action".

They say that they look for accomplishing three objectives with the proposed activities:

- Make the child aware that he or she is thinking.
- Help the child have a series of successful experiences.
- Help him to form concepts, to organize his thought.

They also made some decisions regarding communication:

. . . we want the child to find the greatest pleasure possible in thought, we have made the thinking games nonverbal. This insures that even those children with a poor aptitude for language can be completely successful (Wolff and Wolff 1974, 12).

They organize the games in ten different categories:

- Sorting, ordering and classifying.
- Strategy.
- Permutation.
- Probability.
- Perspective.
- Movement and role play.
- Tactile messages.
- Memory.
- Symbol picture logic.
- Creative thinking.

It is important to be aware of the fact that the activities proposed in the book Games Without Words are designed as recreational workshops to be performed by groups of deaf children with the guidance of a teacher. It is also necessary to clarify that some of the concepts expressed by the authors do not necessarily correspond with the approach proposed in this thesis. However, this was considered a valuable work because it is one of the few experiences, found in this research, which has experimented with

some of the aspects of recreation for deaf children using scientific methodology.

Finally, it is necessary to say that I received many suggestions and ideas from people whom I interviewed, ranging from signing dolls, puppets and recreational books, to adaptation of actual toys or equipment such as a toy version of the TDD. Probably one of the most exciting suggestions was the idea of incorporating in a toy the technology of holography to interact with deaf children, made by Mr. Gary Mowl in the NTID.

Summary

All the information that was reviewed throughout the research process would be totally useless if it didn't provide indications of how to design toys for deaf children. Therefore, the data presented in this report was always analyzed to show its possible implications in relation to this specific design problem.

First, it was confirmed that there does exist a need and interest for a product like the one proposed in this thesis. After that, my first resolution was to adopt a sociological approach as the general philosophy that would determine all the other decisions in the project. Then, according to that approach, a group of objectives and parameters, regarding different aspects relevant to this project, were discussed and defined. Finally, a review of the market and a number of suggestions made by people related to the deaf opened a broad range of possibilities for this project.

The need for the product, the adopted philosophy, the defined parameters, and the possibilities opened during this research phase constitute the tools to be used in order to reach a solution to the problem through the design process during the next phase.

Design Process

Objectives

To start explaining the design process it is necessary to begin by listing, from the most general to the most specific, the goals pursued during this project.

There were three general objectives established for this thesis. First of all, as for any other toy, the most basic objective of this product would be to provide fun. Second, being an educational toy, the product should be able to transmit a positive message to the child who is playing with it. And third, the toy should be flexible enough to adapt to different social and ethnic environments. Even though those objectives are difficult to measure, they were used throughout the design process as a guide to keep the project on track.

A group of goals more specific to the problem of designing a toy for hearing-impaired children was also established, all of them based on the results of the research:

-Improve the social exchange of deaf children not only with other deaf individuals but also with hearing people

-Explore ways to reinforce values of the Deaf culture with the toy.

-Promote any kind of language development.

-Contribute to an easier understanding of the physical environment for the deaf children.

-Increase levels of self-confidence in deaf children.

Parameters

In order to accomplish the objectives of this thesis in the best possible way, the next step was to establish a group of guidelines to be observed all along the process:

- No stigma attached to the toy.
- Visual and tactile stimulation.
- An avoidance of auditory signals.
- Two or more players.
- Room for creativity.

Many products, designed not only for the hearing-impaired but also for other groups of differently-abled people, have failed because people refuse to use them as a result of the inappropriate connotations that some of those products carried. Therefore, one of the most important premises of this project is that no stigma should be attached to the toy.

Regarding the physical characteristics of the product, two previous decisions were made. First, obviously the toy could not

use any auditory signal as a part of its functioning. Second, the toy should provide visual and tactile stimulation to the child. That means that color, shape, texture and light must play an important role in the final solution.

According to the objective of using the toy as a socializing tool for deaf children, it is important to remember that the product should be designed to be used by at least two persons at the same time.

Finally, I considered that toys that can be used only in one way are toys that very soon become boring. Also, I believe that allowing children to use their imaginations is the best way to achieve full development of their capabilities. Therefore, the intention in this project was to design a toy where not everything is predetermined.

Initial concepts

Once the objectives and parameters were established, I started the preliminary sketching phase. The idea was to explore several possible paths leading to the solution of the design problem. At this stage, I considered that the level of the proposals should be absolutely conceptual without any commitment to a definitive shape. By the end of this phase, I produced three concepts each one addressing different aspects within the goals of this thesis. In this section I will briefly explain the two of them that were not chosen for further development as well as the one that was used.

Interactive puzzle

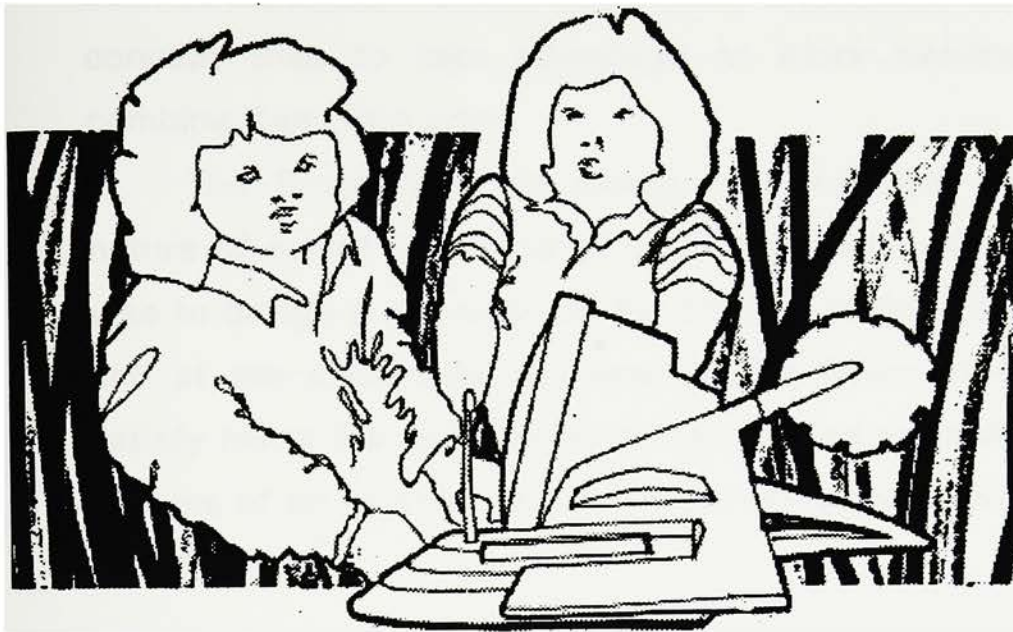
When studying the implications of sound and meaning during the research, I realized that sometimes deaf children do not have the elements to establish the link between cause and effect of physical changes or behaviors which occur around them on a daily basis. This is a factor which produces a considerable amount of anxiety and confusion in those children and can very easily lead to their isolation. Therefore, I thought that a way to facilitate the approach of deaf children to a productive and happy life would be to create mechanisms that could help them to establish the missing connection between those apparently independent fragments of information. My first concept, the Interactive Puzzle, tries to incorporate that idea into a toy.

I defined this toy as an electronic game that explains relationships between stimulus and events related to sound. This toy would expose deaf children to hypothetical situations that encourage them to acquire knowledge useful for them in real life. The game would have several different levels of complexity and would also provide visual or numerical rewards when the puzzles were successfully completed.

The Sound Machine

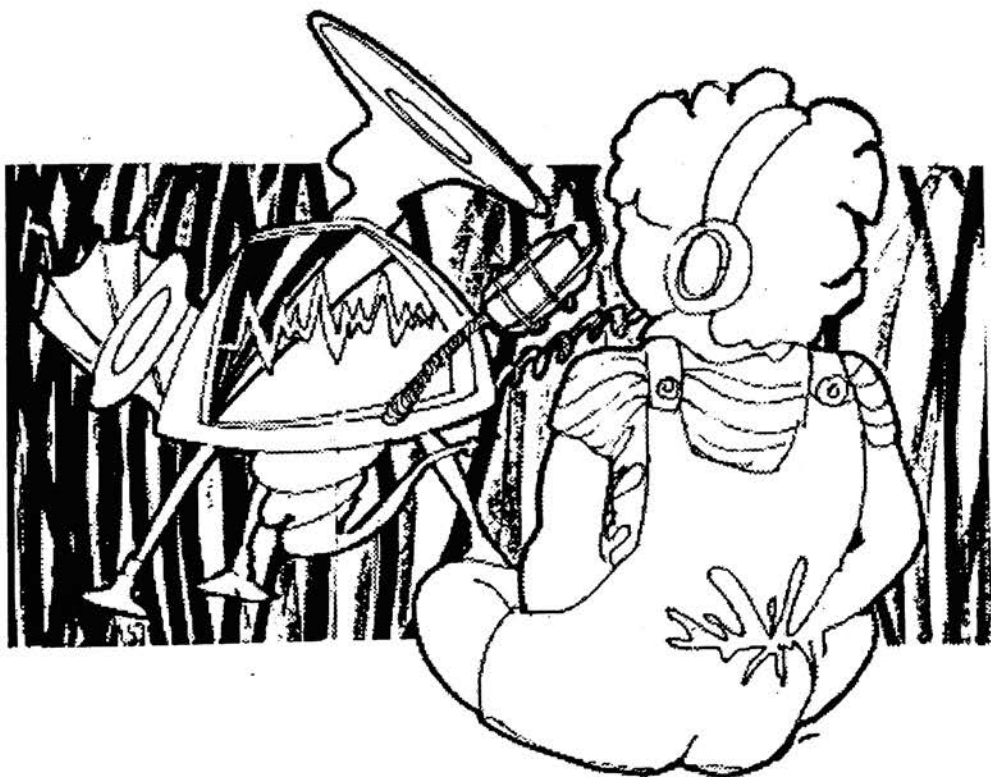
Through the literature review I found many stories that explained how deaf children felt a natural fascination toward sound. Those stories show that apparently there is a widely spread tendency among deaf children to explore and incorporate elements of sound through the games that they invent for themselves. It was also demonstrated that many deaf people have

Initial Concepts



Electronic game which explains relationships between stimulus and events related to sound

Interactive Puzzle



Toy that illustrates the nature of sound by means of visual and tactile signals

Sound Machine

innate knowledge of some concepts usually associated to sound such as loudness, rhythm, dissonance, assonance, etc. My second concept tries to take advantage of those circumstances and combine them into a toy.

The Sound Machine would be a toy that illustrates the nature of sound by means of visual and tactile signals. The idea was to design a toy whereby the children could interact, compete and at the same time get very graphic information that would satisfy his or her curiosity in matters related to sound. In this toy the use of an exciting and self-explanatory image was considered very important.

The Silent Walkie -Talkie

The Silent Walkie-Talkie is a version of a regular walkie-talkie where children can communicate from a distance by typing and reading instead of talking and hearing. To play with this product will require at least two children, each one with a communication device. This toy will have input and output devices that allow children to transmit and receive messages from a reasonable range of reach. It will also have appropriate warning signals which will let them know when a message arrives.

Several factors were considered in order to select the final direction for this project. The Silent Walkie-Talkie was chosen as the option that best suited the established objectives.

First, this concept addresses the social variables of the design problem. The Deaf community, in the same way as any other subculture, needs to establish connections with the rest of society. During the investigation, I found out that in general deaf children tend to be behind hearing children in terms of social development. On the other hand, it is well known that toys can be very effective means of socialization during childhood. Consequently, I decided that a product which takes advantage of the function of the toy as a socializing tool would be particularly useful in this case.

Second, this idea promotes written language development. Communication is the key of any attempt to expand the social horizons of an individual or a group. But, to design a toy which allows a Deaf child to interact with other deaf children and even with hearing children implies finding a common ground where all of them can communicate at the same level. This common ground is the written language. For this reason, the Silent Walkie-Talkie will encourage the improvement of reading and writing skills in those children.

Third, the Silent Walkie-Talkie carries an educational function. The suggestion that I received most often as a possible toy for deaf children was to make a children's version of a TDD. The potential benefit of that idea is that a toy like a TDD would familiarize deaf children with the actual device. I think that the Silent Walkie-Talkie will serve as a training for a communication device such as the TDD as well as for any other technology which involves communication among deaf people.

Silent Walkie-Talkie



Version of a regular walkie-talkie where children can communicate from distance by typing and reading instead of talking and hearing

Finally, the Silent Walkie-Talkie is an "open-ended" toy. That means that it is a toy which children can adapt to many different game situations. The Silent Walkie-Talkie is a toy with no predetermined rules. That feature applies very well to the intention of leaving room for the creativity of the child.

Specific requirements

Once a final direction was chosen for the project, the effort was concentrated in giving a definite shape to the idea of the Silent Walkie-Talkie. In this regard a number of preliminary requirements were established.

Since this toy is supposed to be used during very active games, it must not interfere with freedom of movement. To achieve that freedom of movement, it was decided that the toy should be somehow attached to the body of the child so he or she wouldn't have to hold the toy in his/her hand. Several locations were studied for that attachment. The factors taken into consideration were comfort, accessibility and adequacy for the tasks to be performed. According to these factors, I opted to design the toy as a bracelet to be worn attached to the child's forearm.

Also, as a consequence of that decision it became necessary to fit all the components of the design in only one piece of equipment. That requirement would be a challenge considering that the concept of the Silent Walkie-Talkie involves a considerable number of space consuming parts such as keyboard, displays, batteries, control buttons, etc.

I decided that special consideration should be given to the image of the product. According to the philosophy of this thesis, since deafness is not a deficit but a social feature, this is a product that will not hide the condition of the user. Therefore color, shape and texture will be used not only to achieve the visual stimulation of the child, but also to emphasize values of the Deaf culture through the semantics of the product.

In summary four specific requirements were established for the Silent Walkie -Talkie:

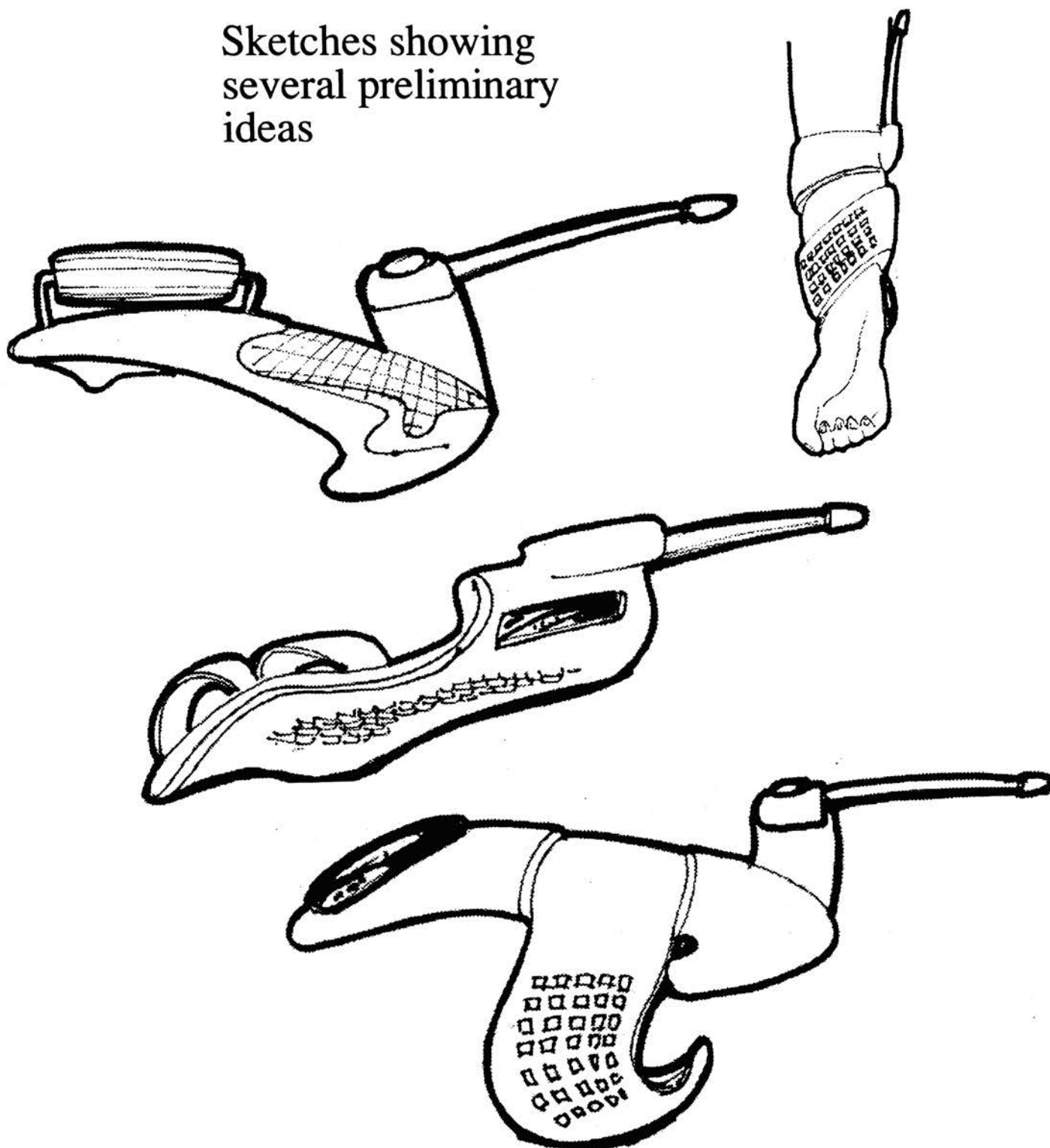
- It should be designed to be worn attached to the child's forearm.
- All components should fit in only one piece of equipment.
- Color, textures and shape should be used to make the design visually exciting.
- The semantics of the product should communicate values of the Deaf culture.

Design development

Different possible configurations for the toy were explored through a new sketching phase. As it was anticipated, one of the main problems to solve was the aspect of space. The need to fit all the necessary components within the dimensions of a child's forearm strongly affected the form of the product. Particularly, in the case of the keyboard, it became evident that it was necessary to explore innovative solutions which would allow that object to

Design Development

Sketches showing
several preliminary
ideas



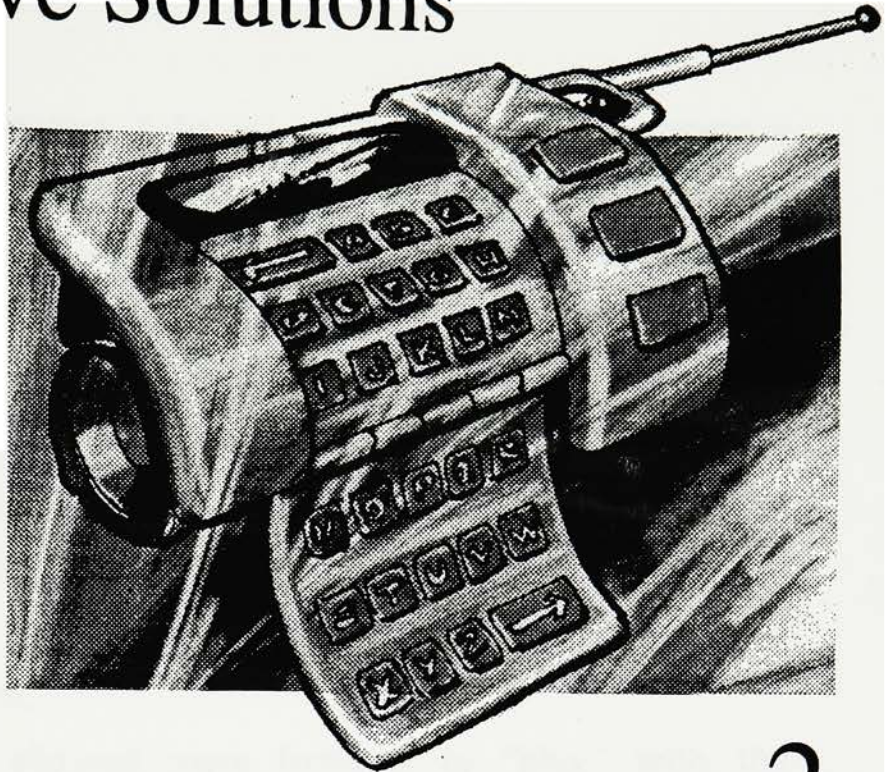
be smoothly incorporated into the design. At the end of this stage three different alternatives were proposed.

The first alternative was a solution showing a very organic form designed to comfortably accommodate the shape of the human forearm. The idea was to build the components into a flexible plastic skin which would allow the toy to grab that part of the body and to be adapted to different sizes. In order to save space, instead of a 26 character keyboard, this option shows a set of numbered keys, each one programmed with pre-established messages. Even though this solution has some virtues, it was discarded because the pre-established messages do not allow the kind of creativity and flexibility desired for the toy.

The second alternative incorporates a regular 26 character keyboard displayed into two hinged halves. This solution proposed that the keyboard would be able to close over itself, so the user would expose the keys only when typing is needed. Although this solution makes it possible to communicate any kind of message, providing in this way the required flexibility of use, the size of the product is still not as small as it should be.

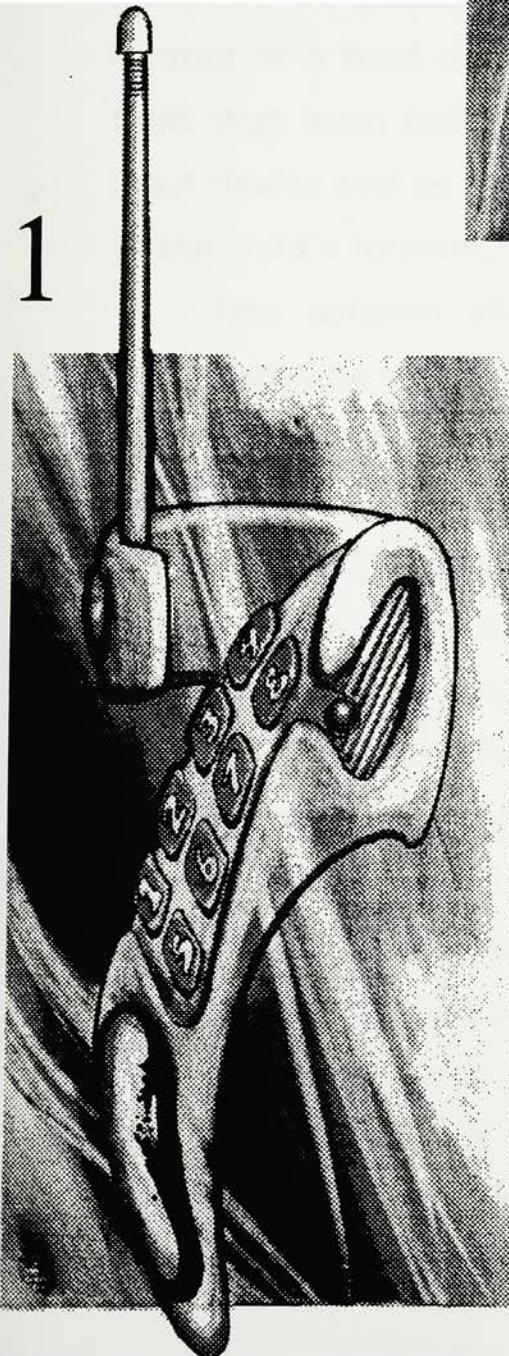
The last alternative, explained in detail in the next section, was selected as the solution that best fulfilled all the requirements.

Alternative Solutions



2

2.- This alternative contains a regular 26 character keyboard divided into two hinged halves that can be kept close whenever there is no need for typing.



1

1.- Instead of a 26 character keyboard this option shows a set of numbered keys, each one programmed with pre-established messages

Final solution

The third alternative is based on the idea of developing a flexible keyboard that could be wrapped around the arm as a bracelet when the device is not in use. I found that this could be done by using an already existing technology, membrane circuits.

In this alternative all the electronic parts for transmission and reception of messages as well as the source of energy were located in a hard main body. The flexible keyboard would hang from that main body and would have a double function: as an input device and as an aid to hold the toy in place when attached to the child's forearm.

This solution allowed more freedom to "play" with the formal aspects of the design. The shape of the product shows a number of soft curves to adapt the toy to the contours of the human body. Those curves are combined with straight lines and relatively sharp edges to obtain a balanced and crisp form. The different functions of the components were expressed with different materials which provided the design with a rich variety of textures and colors. The parts that make contact with the arm are provided with cushioning to maximize comfort.

A simple graphic design was used to complement the shape. The name of the toy will appear on the main body in lowercase 24 point Helvetica typeface. The keys in the flexible keyboard are simply the letters in alphabetical order raised individually about 2.5 millimeters on top of the rubber-like surface.

I wanted the product to have a high-tech image but at the same time to show a playfulness which would indicate its nature

as a toy. Also, I thought that the toy should look and feel comfortable. I think those objectives were achieved in the final form.

Components

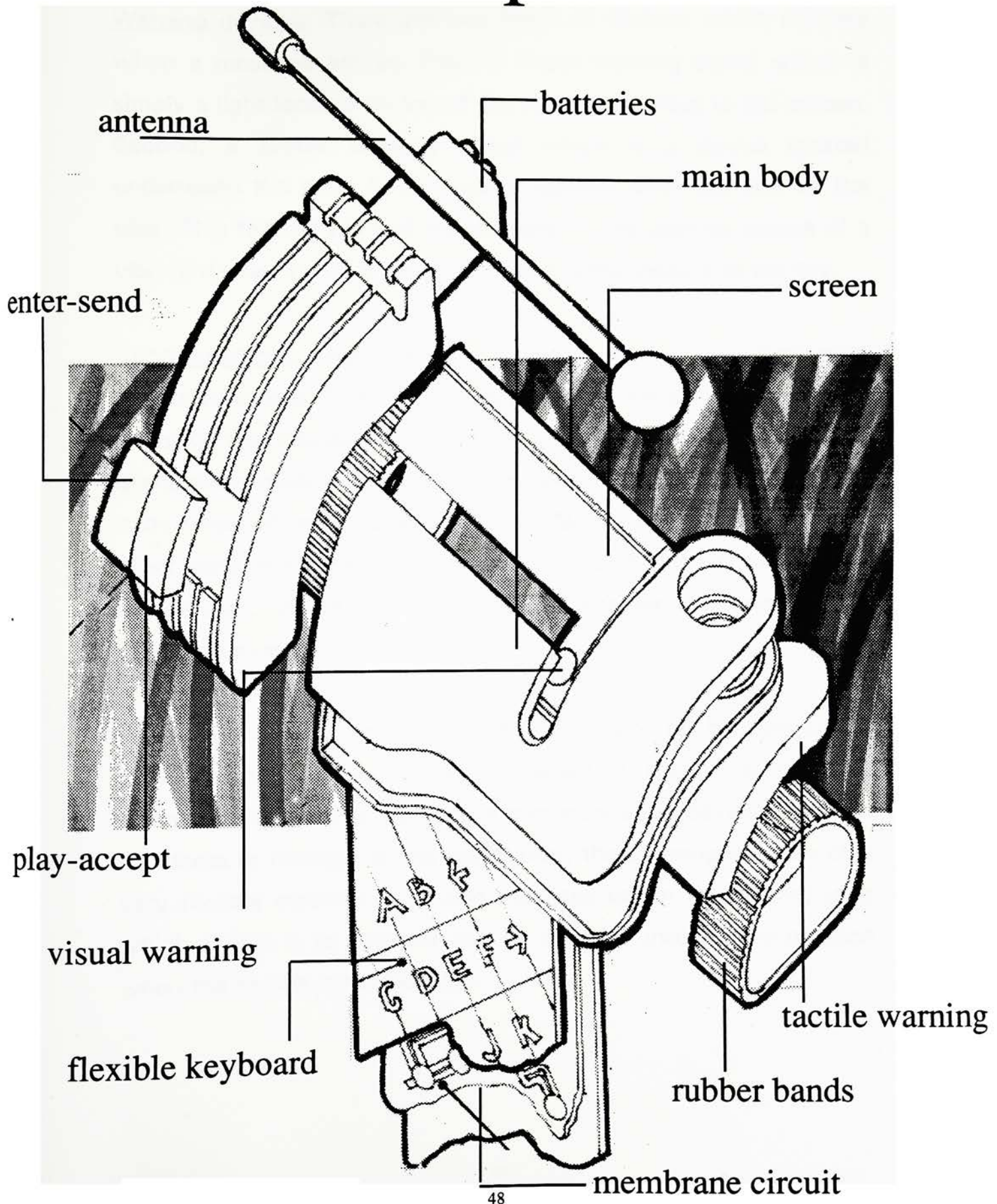
Several elements were integrated in the final solution in order to accomplish an adequate functioning of the toy. A brief description of the main components of the Silent Walkie-Talkie will help to clarify the characteristics of this product:

Flexible keyboard. This is the device which will allow the user to input the messages that he or she wants to transmit. It is a "sandwich" structure which consists of a membrane circuit in between two sheets of some kind of elastomer. As stated before, the keys will be simply the shape of raised letters molded into the front layer. Besides the 26 characters of the alphabet, the keyboard includes a "space" and "backspace" key, each one represented by an arrow.

Main body. Basically it is a case whose main function is structural. The main body holds all the other components together. It will contain most of the necessary electronic parts, and it will also serve as storage for the batteries. This would be a molded part made of ABS or some similar material.

Screen. This is a digital display where the user can read a message that he is receiving or check what he is typing.

Components



Warning devices. There are two kinds of devices which indicate when a message arrives. First, a visual warning signal which is simply a light located on top of the main body, next to the screen. Second, a tactile warning signal which is a device located underneath the main body, making contact with the skin of the user. This feature will call the attention of the user by means of a vibration even in cases when he or she is not looking at the toy.

Control buttons. There are two big bold control buttons both with double functions. The "play-accept" button will allow to display a message that has been received from the other walkie-talkie. Also, it will allow display of a message typed by the user in order to let it be checked before it is sent. The "enter-send" button, on the other hand, will allow storing of a message after it has been typed by the user. It will also tell the machine to send the message to another player.

Antenna. Two reasons determined the inclusion of this component in the design: first, to improve the reception; second, to facilitate the recognition of the object as a communication device. To avoid accidents or damage during rough play, the antenna is made of a very flexible material. It is also mounted on an articulating joint which allows it to collapse and be snapped into a safe position when the device is not needed.

Fasteners. Two elastic "rubber" bands hold the toy to the forearm. That solution has the advantages of making the toy easy to put on and take off and, also makes it adjustable to almost any size.

Human factors

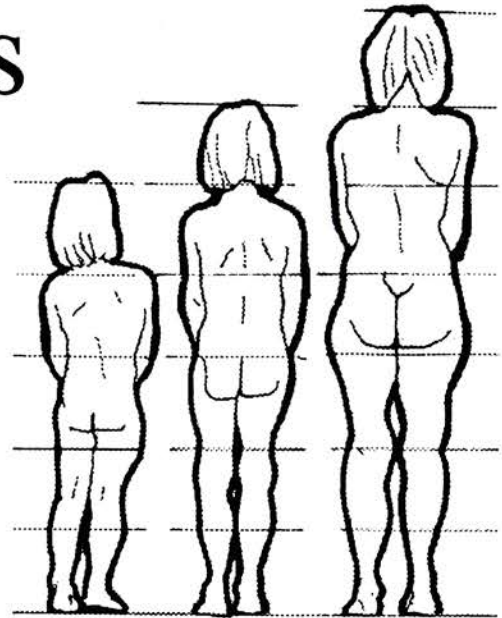
Variables related to human factors had an important impact on three different aspects of this product: market segment, arrangement of the components, and functioning of the toy.

As stated during the research, age is not always an accurate indicator to define the target market of a product. In the case of the Silent Walkie-Talkie, the feature that will determine if the toy is appropriate for a particular user is his or her ability to read and write. It is considered that by the age of eight years the average child could have enough reading and writing skills to be able to use this product at least on a basic level. Therefore, the toy was designed to fit the physical and mental characteristics of eight-year-old or older children.

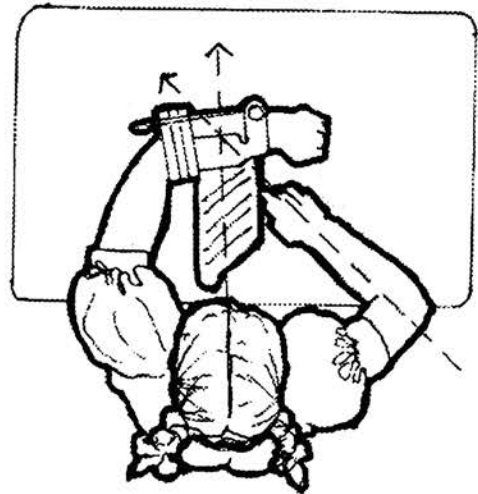
One of the assumptions of this project is that children do not always adopt conventional positions to execute a task, especially when they are playing. The Silent Walkie-Talkie is a toy which certainly takes advantage of this idea. For instance, using a flexible keyboard implies finding a hard surface as a support while the user is typing. When I tested the mockup with several children, they chose almost any imaginable surface as a support (floor, walls, trees, palm of the hand, etc.) and adopted almost any

Human Factors

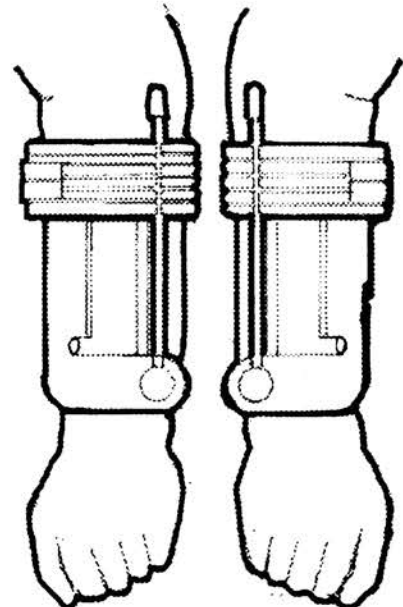
The toy was designed considering the physical and mental characteristics of approximately eight-year-old or older children.



The positioning of the screen and the 45° arrangement of the characters on the keyboard accommodates the natural angles of arms and vision when the toy is being used.



There would be one right-handed version and one left-handed version of this toy. Considering that it might be helpful for the signing skills of deaf children to develop a certain dexterity in both hands, it could be convenient to sell this product in a set of two, each containing a sample of each version.



possible position. Those children seemed to enjoy this small challenge as part of the fun of the game.

Also, some of the components of this toy had to be adjusted after studying how children used the mockups of the product. The positioning of the screen and the 45° arrangement of the characters on the keyboard were decided in order to accommodate the natural angles of arms and of vision when the toy is being used. The spacing between the keys as well as the size of the control buttons corresponds to the level of dexterity expected from children.

Deaf children need to efficiently use both hands when communicating in sign language. That fact gave me an idea. I thought that it might be helpful for the signing skills of deaf children to equally exercise both left and right hands with the toy. Considering this, it could be convenient to sell this product in a set, each set containing a right-handed version and a left-handed version of the Silent Walkie-Talkie.

Finally, an explanation of the normal sequence of steps will help to complete the understanding of the product. To that effect a simple example with two imaginary players called A and B is going to be used:

- Player A: types a message using his flexible keyboard.

- Player A: sees the message on the screen while he is typing.

-Player A: when typing is finished, he hits the "play-accept" button once to reread what he just typed.

-Player A: discovers a mistake in the text, so he uses the backspace key to reach the error and then corrects it.

-Player A: once the message is double checked and corrected, he hits the "enter-send" button once to introduce it into the memory of his walkie-talkie.

-Player A: decides to send the message to player B, so he hits the "enter-send" button twice to indicate the device to transmit the message.

-Player B: is not looking at the toy so he does not see the light that indicates the reception of the message. However, the tactile signal makes him aware of what is happening. The message has been stored in the memory of his walkie-talkie, but it does not show on the screen yet.

-Player B: hits the " play-accept" button twice to see the message on the screen.

Evaluation

At this stage, the Silent Walkie-Talkie is not a finished project. I consider it to be in an advanced conceptual stage. Several areas would require further development and adjustments. For instance, the technical details of the flexible keyboard are not totally defined and tested. However, the final direction adopted for the Silent Walkie-Talkie shows several potential advantages to make this a successful product:

-Space saving. This is a very economic solution in terms of space. The arrangement of components was accomplished in a way that allows the toy to be compact enough to comfortably fit on the child's forearm.

-Non intrusive. The toy was designed in a way that does not interfere with the activities of a child while the walkie-talkie is not being activated.

-Visually attractive. The appearance achieved in the toy will invite other children to establish communication and play. This way the product will provide means to facilitate the socialization of the deaf child.

-Innovative. Not only is the concept of the product new, but also, the inclusion of unusual features, like the flexible keyboard, has the effect to promote curiosity and stimulate the imagination; consequently, it is more fun.

-Product semantics. The image of the product is clearly readable as a communication device and as a toy. It certainly does not carry any stigmatic connotations. Also, a symbolic content could be found in this product: to have something that resembles a

tongue attached to the arms of children who communicate through sign language is an appropriate metaphor.

Conclusion.

Since the early stages of the development of this thesis, I learned two important things. First, a deaf person is not a handicapped person. Second, the deaf community is a social group with its own particular culture, values and needs. To keep those two facts in mind during the entire project helped me to build a structure of thoughts and to orient my decision-making process towards a definite direction.

The Silent Walkie-Talkie is a product specifically designed for the deaf. The premise of this project was always to respect the identity of deaf people as a community and as a social group. However, this is a product designed to mainstream deaf people not isolate them. Those two aspects, identity and integration, were always at the top of the scale of priorities for this project.

I honestly believe that the core of the decisions made during this project followed that spirit. For example, making the product available and attractive not only to deaf people, but also to hearing people brings some potential commercial benefits. But this was not a basic marketing decision; the decision had more to do with the enormous benefits that deaf people would obtain by increasing their interaction with other groups in the society. Hopefully, this project can serve as a demonstration of the

potential of an integrating product that is not only for the deaf, but also for hearing people.

To conclude, I believe that the attitude and the spirit behind a particular design is, to say the least, as important as the specific characteristics of the proposed solution. I only hope that the knowledge of and respect for the deaf that I have gained this past year has had an impact on the final results of this project and will continue to influence my approach to design in the future.

Renderings

fig. 07



fig. 08

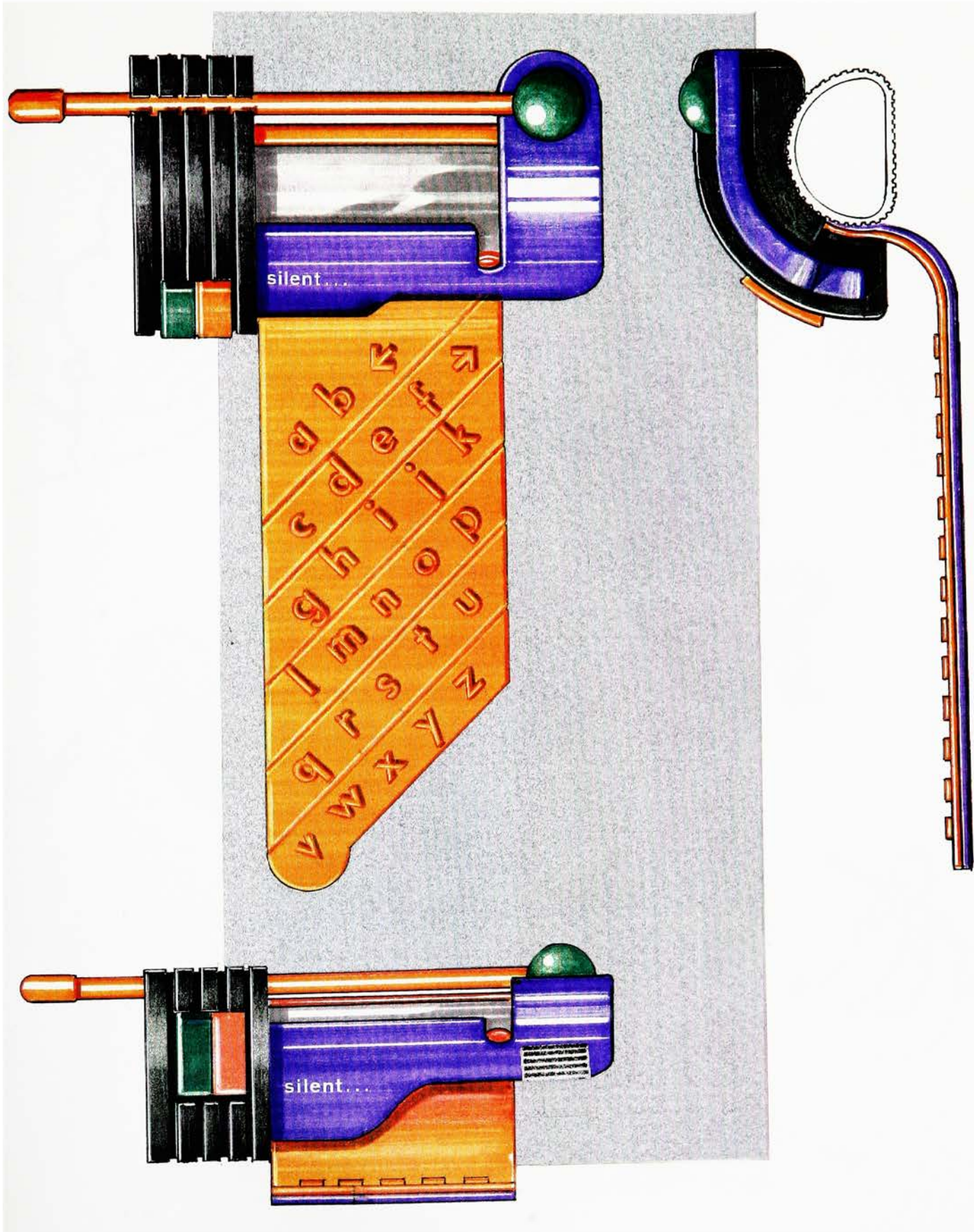
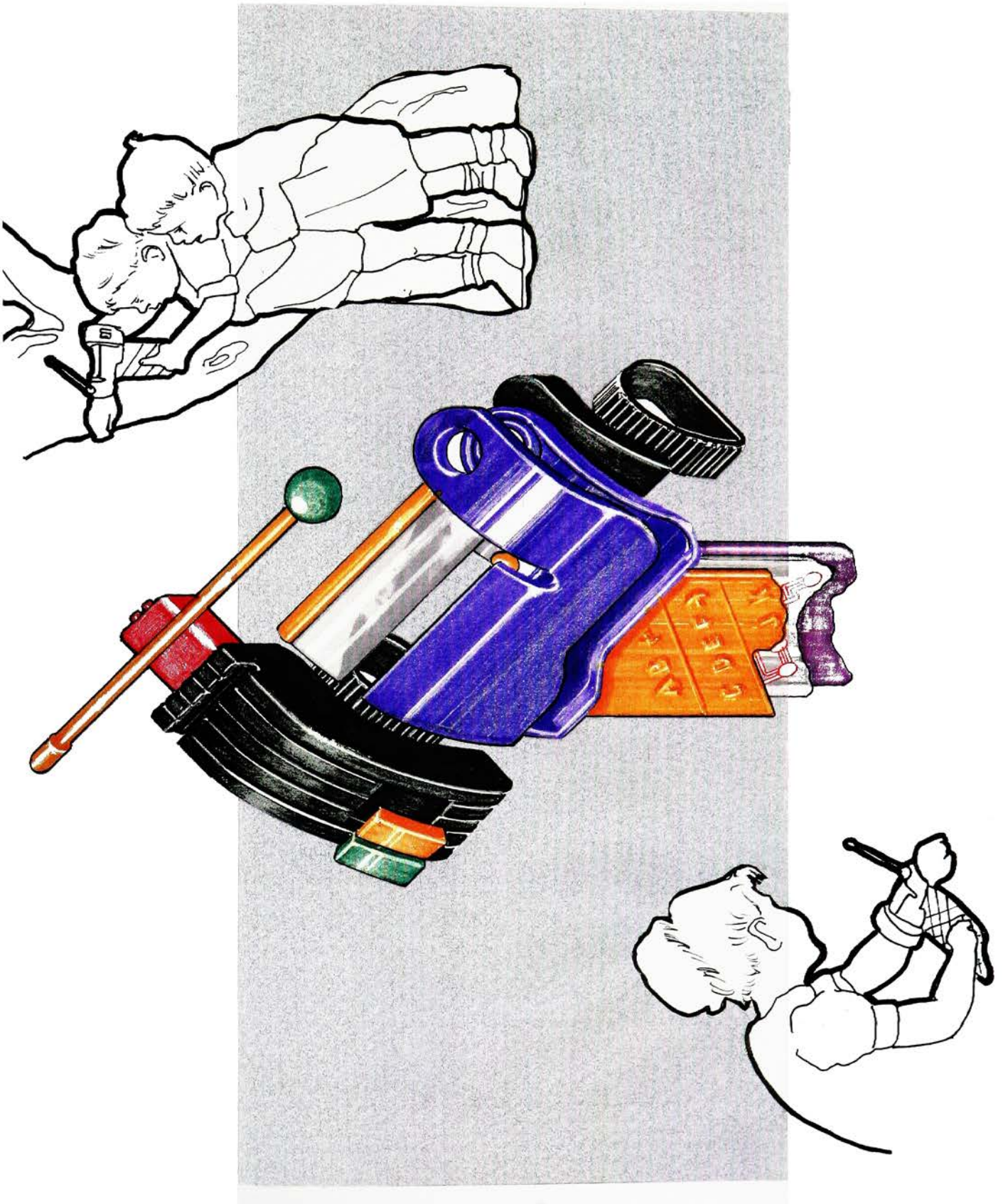


fig.09



Models

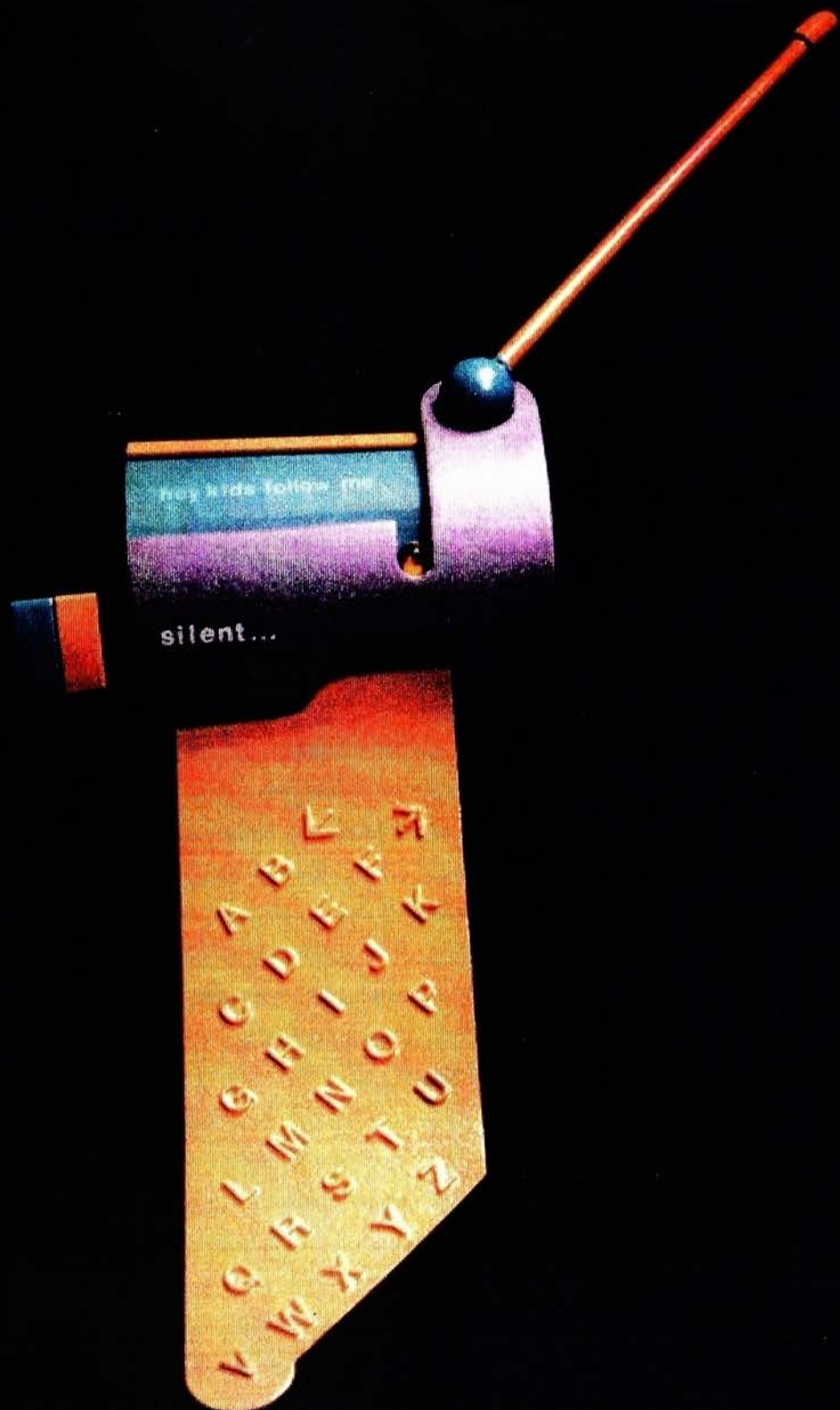
fig. 10



fig.11



fig. 12



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